Claims

1. Method to generate control data sets for the production of metallic and/or non-metallic products (2, 21), in particular dental products or medical products, by freeform sintering and/or freeform melting by means of a high-energy beam (8), in particular a laser beam or electron beam, whereby a product (2, 21) is built up layer by layer (12-15, 20, 22), out of a material (6) to be added layer by layer, by means of a beam (8) guided with the help of a control data set, whereby the method comprises the steps of loading (23) a product target geometry data set, which represents the target geometry of the product (2, 21) to be produced, and of generating (25) the control data set on the basis of the product target geometry data set,
characterized by the further steps of
determining (24) a compensation data set and/or a compensation function to compensate for manufacturing-related effects caused by the sintering and/or melting, and
combining (25) the compensation data set with and/or applying the compensation function to the product target geometry data set to generate the control data set.

2. Method of claim 1,
characterized in that
the compensation data set or the compensation function is determined in dependence on the size and the shape of the product (2, 21) to be produced.

3. Method of claim 1 or 2,
characterized in that
the compensation data set or the compensation function is determined in dependence on an angle of inclination (α) of a plane placed tangentially to an exterior surface of the product (2, 21) to be produced relative to a reference plane, in particular a horizontal plane.

4. Method of claim 4,
characterized in that
a thickness (d) of the product to be produced, measured perpendicular to said tangential plane, is reduced by means of the compensation data set or the compensation function in dependence on said angle of inclination (α).

5. Method of one of the preceding claims,
characterized in that
the compensation function is continuous and differentiable.

6. Method of claim 5,
characterized in that
the compensation function contains a polynomial of 2^{nd}, 3^{rd}, 4^{th}, and/or higher degree.

7. Method of claim 6,
characterized in that
for one product several compensation functions are used, which at least partially differ with respect to their degree.

8. Method of claim 7,
characterized in that
a polynomial of lower degree is used for simple-geometry regions of a product to be manufactured, while a higher-degree polynomial is used for complex-geometry regions of a product to be produced.

9. Method of one of the preceding claims,
characterized in that
the compensation function is applied to the product geometry data set for only certain regions of the product to be produced.

10. Method of claim 9,
characterized in that
the compensation function is applied to the product geometry data set only for the connecting regions of a bridge to be produced as dental prosthesis.

11. Method of one of the preceding claims,
characterized in that
the compensation data set and/or the compensation function are determined with the help of at least one parameter out of a group of parameters that includes:
- the modulus of elasticity of the material (6),
- the solidus temperature of the material (6),
- the thermal expansion coefficient of the material (6),
- the tensile strength of the material (6),
- the elastic yield point of the material (6),
- a processing chamber temperature that represents the temperature in a processing chamber surrounding the material (6) to be processed,
- a processing temperature that represents the temperature of the region of the material (6) irradiated by the beam (8),
- a layer thickness (d) that represents the thickness of a material layer (12-15, 20, 22) that has been or is to be applied,
- the power of the beam source, in particular of the laser (7) or the electron beam source, or the power of the beam, in particular the laser beam (8) or the electron beam, during the process of the sintering or melting,
- the traverse rate of the beam (8),

- the irradiation strategy,
- the geometry of the product (2, 21) to be produced,
- the height of the product (2, 21) to be produced, and
- the type of a possible secondary treatment of the product (2, 21) after the sintering or melting.

12. Method of one of the preceding claims,
characterized in that
during and/or after the irradiation of a material layer (12-15, 20, 22), a contour already created or being created of the product (2, 21) is optically scanned and the measurement data obtained in this manner are compared to the data of the product target geometry data set, and that in the event of a detection of a deviation, the control data set is corrected in accordance with the detected deviation.

13. Device for generating control data sets for the production of metallic and/or non-metallic products (2, 21), in particular dental products or medical products, by freeform sintering and/or freeform melting by means of a high-energy beam (8), in particular a laser beam or electron beam, and for carrying out a method of one of claims 1 to 12, whereby a product (2, 21) can be built up layer by layer, from a material to be applied layer by layer, by means of said beam (8) guidable with the help of a control data set,
whereby the device (11) comprises
- means for loading (23) a product target geometry data set that represents the target geometry of the product (2, 21) to be produced, and
- means for generating (25) the control data set on the basis of the product target geometry data set,

characterized by
- means for determining (24) a compensation data set and/or a compensation function to compensate for manufacturing-related effects caused by the sintering and/or melting, and

- means for combining (25) the compensation data set with and/or applying the compensation function to the product target geometry data set to generate the control data set.

14. Apparatus for the production of metallic and/or non-metallic products (2, 21), in particular dental products or medical products, by freeform sintering and/or freeform melting by means of a high-energy beam (8), in particular a laser beam or electron beam, whereby the apparatus comprises:
    - a beam source (7), in particular a laser or an electron beam source, for generating said beam (8),
    - a platform (4) to hold a material (6) to be deposited in layers,
    - a control system (11) for controlling the beam (8) that is data-driven to guide the beam (8) to build up a product from the material (6) layer by layer (12-15, 20, 22),

    characterized in that
    the control system (11) comprises a device for the generation of control data according to claim 13 for guiding the beam (8).